WHAT IS CLAIMED IS

1. A microfabricated fluidic amplifier device, comprising:

an elastomer block formed with an input chamber and an output chamber, that amplifies the pressure in the output chamber relative to the input chamber, wherein fluid in the input chamber is isolated from fluid in the output chamber.

2. The microfabricated fluidic amplifier device of claim 1 wherein the input chamber is formed in a first elastomer layer and the output chamber is formed in a second elastomer layer.

3. The microfabricated fluidic amplifier device of claim 2 wherein the second elastomer layer further comprises a third chamber at least partially surrounding the output chamber.

4. The microfabricated fluidic amplifier device of claim 3 wherein the third chamber is filled with a fluid at ambient pressure.

5. The microfabricated fluidic amplifier device of claim 2 wherein the first elastomer layer comprises a rigid material in the input chamber above the output chamber.

6. The microfabricated fluidic amplifier device of claim 1 wherein the amplifier device is configured to perform integration.

7. The microfabricated fluidic amplifier device of claim 1 wherein the amplifier device is configured to perform differentiation.

8. A microfabricated fluidic switch, comprising:

an elastomer block formed with a gate channel and a drain-to-source channel, that closes and opens the drain-to-source channel in response to pressure changes in the gate channel,

wherein pressure in the gate channel does not need to be increased above, or decreased below pressure in the drain-to-source channel.

9. The microfabricated fluidic switch of claim 8 wherein the gate channel is formed in a first elastomer layer and the drain-to-source channel is formed in a second elastomer layer.

10. The microfabricated fluidic switch of claim 9 wherein a rigid material is formed on the second elastomer layer in the gate channel.

11. The microfabricated fluidic switch of claim 9 wherein a first chamber is formed in the second elastomer layer adjacent to the drain-to-source channel.

12. The microfabricated fluidic switch of claim 11 wherein a second chamber is formed in the second elastomer layer adjacent to the drain-to-source channel.

13. The microfabricated fluidic switch of claim 9 wherein a first chamber is formed in the first elastomer layer adjacent to the gate channel.

14. The microfabricated fluidic switch of claim 13 wherein a second chamber is formed in the second elastomer layer adjacent to the drain-to-source channel.

15. The microfluidic switch of claim 8 wherein the switch is a pressure actuated normally open switch.

16. The microfluidic switch of claim 8 wherein the switch is a pressure actuated normally closed switch.

17. The microfluidic switch of claim 8 wherein the switch is a vacuum actuated normally open switch.

18. The microfluidic switch of claim 8 wherein the switch is a vacuum actuated normally closed switch.

19. A microfabricated fluidic logic device, comprising:

an input channel and an output channel; and

a first microfabricated fluidic switch, wherein the microfabricated fluidic logic device performs a logic function on an input signal in the input channel to provide an output signal in the output channel.

20. The microfabricated fluidic logic device of claim 19 wherein the output signal is the inverse of the input signal.

21. The microfabricated fluidic logic device of claim 19 wherein the microfabricated fluidic logic device is an OR gate.

22. The microfabricated fluidic logic device of claim 19 wherein the microfabricated fluidic logic device is a NOR gate.

23. The microfabricated fluidic logic device of claim 19 wherein the microfabricated fluidic logic device is a AND gate.

24. The microfabricated fluidic logic device of claim 19 wherein the microfabricated fluidic logic device is a NAND gate.

25. The microfabricated fluidic logic device of claim 19 wherein the microfabricated fluidic logic device is a flip-flip.

26. The microfabricated fluidic logic device of claim 25 wherein the flip-flop comprises first and second cross-coupled NAND gates.

27. The microfabricated fluidic logic device of claim 26 wherein each of the two NAND gates comprises two pressure actuated normally open switches coupled in parallel.

28. The microfabricated fluidic logic device of claim 25 wherein the flip-flop comprises first and second cross-coupled NOR gates.

29. The microfabricated fluidic logic device of claim 28 wherein the two NOR gates comprise two pressure actuated normally open switches coupled in series.

30. The microfabricated fluidic logic device of claim 28 further comprising:

first and second step pressure sources coupled to the flip-flop;

a second microfabricated fluidic switch coupled between the first step pressure source and the first NOR gate;

a third microfabricated fluidic switch coupled between the second step pressure source and the second NOR gate.

31. The microfabricated fluidic logic device of claim 28 further comprising:

a step pressure source comprising an output coupled to the flip-flop through second and third microfabricated fluidic switches; and

fourth and fifth microfabricated fluidic switches, each coupled between the output of the step pressure source and ambient exhaust.

32. The microfabricated fluidic logic device of claim 31 further comprising:

a first microfabricated fluidic capacitor coupled to an input of the first NOR gate and the gate of the fourth switch;

a second microfabricated fluidic capacitor coupled to an input of the second NOR gate and the gate of the fifth switch;

a first fluidic resistor coupled to the first capacitor; and

a second fluidic resistor coupled to the second capacitor.

33. The microfabricated fluidic logic device of claim 28 further comprising:

a step pressure source comprising an output coupled to the flip-flop through second and third microfabricated fluidic switches; and

a fourth microfabricated fluidic switch coupled between the output of the step pressure source and ambient exhaust, wherein the gate of the fourth switch is coupled to a clock signal.

34. The microfabricated fluidic logic device of claim 19 wherein the switch comprises a pressure actuated normally open switch.

35. A microfabricated fluidic pressure source, comprising:

a fluidic pump;

microfabricated fluidic first and second unidirectional valves, each coupled to the pump; and

a microfabricated fluidic reservoir coupled to the second unidirectional valve.

36. The microfabricated fluidic pressure source of claim 35 wherein the pump comprises an elastomeric region with an internal chamber.

37. The microfluidic pressure source of claim 35 wherein fluid is forced through the second unidirectional valve into the reservoir when the pump is compressed or bent.

38. The microfluidic pressure source of claim 35 wherein at least one of the unidirectional valves comprises a channel in a region of elastomer material, an elastomer flap, and a stopper in the channel, wherein the stopper prevents the flap from opening the channel when fluid flows in a first direction through the channel, but not in a second direction.

39. The microfluidic pressure source of claim 35 wherein the reservoir comprises a chamber inside a plurality of elastomeric layers.

40. The microfluidic pressure source of claim 39 wherein an elastomer layer above the chamber flexes as the pressure inside the chamber changes.

41. The microfluidic pressure source of claim 35 wherein the microfluidic pressure source is a high pressure source.

42. The microfluidic pressure source of claim 41 wherein at least one of the unidirectional valves comprises a microfabricated fluidic pressure multiplier coupled to a pressure actuated normally closed switch.

43. The microfluidic pressure source of claim 35 wherein the microfluidic pressure source is a vacuum pressure source.

44. The microfluidic pressure source of claim 43 wherein at least one of the unidirectional valves comprises a microfabricated fluidic pressure multiplier coupled to a vacuum actuated normally closed switch.

45. The microfluidic pressure source of claim 35 wherein the microfluidic pressure source further comprises:

a third unidirectional valve coupled to the second unidirectional valve;

a fourth unidirectional valve coupled to the third unidirectional;

a first microfluidic capacitor coupled between the pump and the third unidirectional valve; and

a second microfluidic capacitor coupled between the third and the fourth unidirectional valves.

46. The microfluidic pressure source of claim 35 wherein at least one of the unidirectional valves comprises:

first and second elastomer layers with a first channel there between;

an elastomer spacer in the first channel that is sealed to the first elastomer layer; and

an elastomer flap sealed to the spacer, but not sealed to the second elastomer layer which covers a feed through channel in the second elastomer layer.

47. A microfabricated fluidic switching regulator, comprising:

a microfabricated fluidic pressure multiplier; and

a microfabricated fluidic switch coupled to an output of the pressure multiplier.

48. The microfabricated fluidic switching regulator of claim 47 wherein the switch is a pressure actuated normally closed switch.

49. The microfabricated fluidic switching regulator of claim 47 wherein the pressure multiplier has a first input terminal coupled to a high pressure source, and a second input terminal coupled to ambient exhaust.

50. A microfabricated fluidic capacitor comprising:

a first elastomer layer comprising a first chamber,

a second elastomer layer comprising a second chamber adjacent to the first chamber, and wherein the first and second chambers there is no fluid flow between the first and second chambers.

51. A microfabricated fluidic unidirectional valve, comprising:

a microfabricated fluidic pressure amplifier coupled between an input terminal and an output terminal; and

a microfabricated fluidic switch coupled to an output of the pressure multiplier.

52. A microfabricated fluidic unidirectional valve, comprising:

microfabricated elastomer material that has a flow through channel; and

an elastomer flap attached to the elastomer material in the flow through channel that forms a seal in the flow through channel to prevent fluid from flowing in a first direction through the flow through channel, and to allow fluid flow in a second direction through the flow through channel.

53. The microfabricated fluidic unidirectional valve of claim 52, wherein the elastomer material comprises a stopper in the flow through channel that forms a seal with the elastomer flap when fluid flows in the first direction.

54. A microfabricated fluidic device, comprising:

a plurality of input channels and an output channel; and

a first microfabricated fluidic switch, wherein the microfabricated fluidic device performs a mathematical function on analog input signals in the input channels to provide an analog output signal in the output channel.

55. The microfabricated fluidic device of claim 54 wherein the microfabricated fluidic device performs addition on the input signals to provide the output signals.

56. The microfabricated fluidic device of claim 54 wherein the microfabricated fluidic device performs substraction on the input signals to provide the output signals.

57. The microfabricated fluidic device of claim 54 wherein the microfabricated fluidic device performs multiplication on the input signals to provide the output signals.

58. The microfabricated fluidic device of claim 54 wherein the microfabricated fluidic device performs division on the input signals to provide the output signals.